ANATOMICAL STUDY OF *ERIONEURON* AND *DASYOCHLOA* (POACEAE: CHLORIDOIDEAE: ERAGROSTIDEAE) IN NORTH AMERICA

JESÚS VALDÉS-REYNA

Departamento de Botánica
Universidad Autonoma Agraria "Antonio Narro"
Buenavista, Saltillo, Coahuila 25315, MÉXICO

STEPHAN L. HATCH

S.M. Tracy Herbarium
Department of Rangeland Ecology and Management
Texas A&M University
College Station, TX 77843-2126, U.S.A.

ABSTRACT

Leaf blades of *Erioneuron* and *Dasyochloa* species were analyzed for anatomical details. Analysis of transverse sections and epidermis show that both genera can be clearly delimited. Differences between *E. avenaceum* and *E. grandiflorum* were not found, supporting the interpretation that these are conspecific. Differences between *E. avenaceum*, *E. pilosum*, and *E. nealleyi* were found, suggesting that these be maintained as distinct entities. Differences between *Dasyochloa* and *Erioneuron* support the recognition of *Dasyochloa* as a monotypic North American genus.

RESUMEN

Fueron analizadas láminas de las especies de *Erioneuron* y *Dasyochloa*, para un estudio anatómico detallado. El análisis de la lámina en sección transversal y de la epidermis, muestra que los dos géneros pueden ser claramente definidos. No se encontraron diferencias entre *E. avenaceum* y *E. grandiflorum*, lo que apoya la interpretación de que no son especies distintas. Se encontraron algunas diferencias entre *E. avenaceum*, *E. pilosum* y *E. nealleyi*, que sugieren que éstas se pueden mantener como especies distintas. Las diferencias entre *Dasyochloa* y *Erioneuron*, apoyan el reconocimiento de *Dasyochloa* como un género monotípico para Norteamérica.

INTRODUCTION

Caceres (1950) studied the leaf blade anatomy of *Munroa mendocina* and *Blepharidachne benthamiana* Hitchc. and compared these species with species of *Eragrostis* and *Tridens pilosa* (Buckl.) Hitchc. var. *argentina* (O. Kuntze) L.R. Parodi [syn. *Erioneuron pilosum* (Buckl.) Nash var. *longiaristatum* (Kurtz) Anton]. Tateoka (1961) examined the leaf epidermis of *Tridens*, including

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Erioneuron and he concluded that the epidermal features were of the Chloridoid subtype as described by Prat (1936).

Sánchez (1979a) studied the leaf blade anatomy of three species of *Tridens* and two species, including their varieties, of *Erioneuron* from Argentina. Observations of the unique anatomical features of *Dasyochloa pulchella* (H.B.K.) Willd. ex Rydberg [syn. *Erioneuron pulchellum* (H.B.K.) Tateoka] were made. Sánchez (1979b, 1981) reported the development of the "Kranz" structure in the stems of *Munroa*, *Blepharidachne*, and *Erioneuron* from Argentina. Sánchez (1983) analyzed the anatomical differences between *Dasyochloa* and *Erioneuron* and proposed the segregation of *Dasyochloa* as an independent genus following, in part, criteria as outlined by Parodi (1934).

The grass genus *Erioneuron* was described by Nash in Small's (1903) *Flora of the Southeastern United States*, based on *Erioneuron pilosum*. Tateoka (1961), in a biosystematic study of the genus *Tridens*, presented cytological, morphological, and anatomical differences to support recognition of two distinct genera. One prominent difference was in the basic chromosome numbers, x = 8 for *Erioneuron* and x = 10 for *Tridens*. The results of the examination of the leaf anatomy show that all species of *Tridens* and *Erioneuron* have a Chloridoid subtype of the panicoid type of leaf epidermis, characterized by the presence of globose or club-shaped bicellular microhairs and saddle-shaped silica bodies. Particular kinds of bicellular microhairs were observed in *Tridens* and *Erioneuron*. *Tridens* had bullet-shaped hairs, and *Erioneuron* had ellipsoidal hairs. Differences in the leaf cross-section were found between genera in leaf margin, midrib of the leaf blade, and in the number of vascular bundles within the leaf. Based on these results Tateoka recognized the genus *Erioneuron* and suggested affinities with the genus *Munroa*, rather than with *Tridens*. Sánchez (1979b) studied the leaf anatomy of the species and varieties of *Tridens* and *Erioneuron* from Argentina. That study included a table of characters used to separate the genera, with keys to the species and varieties based on anatomical characters. This classification has been well accepted by agrostologists and used in several grass floras (Correll & Johnston 1970; Nicora 1973; Gould 1968, 1975, 1979; Anton 1977; and McVaugh 1983).

The generic name *Dasyochloa* Willd. first appeared in Steudel (1840) as a synonym of *Uralepis*. Two species of *Dasyochloa* were listed, *D. avenacea* Willd. and *D. pulchella* Willd., both as "nomina nuda." Although Rydberg (1906) validated *Dasyochloa* with an English description as part of a key, it has been regarded as a synonym of *Erioneuron*. Recently Caro (1981) transferred the species of the genus *Erioneuron* (excluding *E. pilosum*) to *Dasyochloa*, based on the lemma morphology. Sánchez (1983) reported that the anatomical features of *Dasyochloa* formed the most important difference within

Erioneuron s.l. She recognized *Dasyochloa* as a monotypic North American genus, consisting of *D. pulchella*.

Leaf blade anatomy of North American species of *Erioneuron* has not been fully studied. This study analyzes the leaf anatomy of *Erioneuron* and compares the results with the studies from Argentina. The results of this analysis will add to the anatomical characteristics of the leaf epidermis not reported by Sánchez (1983).

MATERIAL AND METHODS

Leaf blades were selected from population samples from across the geographic range of each species. Table 1 lists the specimens analyzed. At least three leaf blades were selected from each specimen so that leaf cross-sections and adaxial and abaxial epidermes could be observed and compared. Leaf blade sections one cm long were taken from the specimens. Leaf blades collected in the field were fixed in FAA for 24 hours and then transferred to 70% ethanol. Leaf blades from dried specimens were placed in a high molecular weight solution of 1:3, photo-flo 200 and water until thoroughly imbibed, and then transferred to 70% ethanol. Leaf blades for cross-section analysis were embedded in paraffin using the standard techniques (Berlyn & Miksche 1976). Fifteen sections per plant specimen were sectioned with a rotary microtome at 10–15 μm thickness, stained with safranin and fast green, and made permanent with Permount.

Adaxial and abaxial leaf epidermes were studied following rehydration in a high molecular weight solution. Leaf segments were then placed in a clorox solution for a few minutes to bleach the chlorophyll, placed flat on a microscope slide and scraped with a razor blade until the epidermis, mesophyll, and vascular bundles were removed. The remaining epidermis was stained with Azo-Black, washed with drops of 90% ethanol, and made permanent using Euparal and ethanol. In some instances only small fragments of the epidermis could be obtained because of the furrowed leaf blades and sclerenchyma on the margins. In such cases the remaining epidermis was not stained to avoid the possibility of losing the tissue in the destaining process. The silica cells, silica bodies, microhairs, macrohairs, and prickle hair variations were recorded for each taxon. The descriptions of leaf transections and epidermal structures follow the terminology used by Metcalfe (1960) and Ellis (1976, 1979). All drawings are original and were made with the aid of a drawing tube.

RESULTS AND DISCUSSION

Examination of the leaf blade of *Erioneuron* confirms that this genus has the Cloridoid leaf anatomy as described by Brown (1958), Metcalfe (1960),

TABLE 1. Specimens of *Erioneuron* and *Dasyochloa* used in analysis of leaf transverse sections and epidermal scrapes, listed by species identification, country, state, collector and collection number. Specimens are deposited at ANSM and TAES.

Erioneuron avenaceum (H.B.K.) Tateoka

MEXICO. SAN LUIS POTOSÍ: Guadalcazar, *Valdés-R. 1641*, *1636*, 20 mi N of San Luis Potosí, *Valdés-R.* 1644, Enrique Estrada, *Valdés-R. 1694*. COAHUILA: Saltillo, *Valdés-R. 1701*.

E. grandiflorum (Vasey) Tateoka

MEXICO. NUEVO LEÓN: El Salero, *Valdés-R. 1623*, *1627*.

E. nealleyi (Vasey) Tateoka

MEXICO: COAHUILA: Arteaga, *Hatch et al. 5033*, Saltillo, *Hatch et al. 6045*, *5050*, *Valdés-R. 1455*, Parras, *Valdés-R. 1576*. UNITED STATES. TEXAS. Presidio Co.: *Valdés-R. 1689*.

E. pilosum (Buckl.) Nash

MEXICO. COAHUILA: Saltillo, *Valdés-R. 1502*, *1537*. Nuevo León: Cerralvo, *Valdés-R. 1632*. UNITED STATES. NEW MEXICO. Grant Co.: *Valdés-R. 1681*. TEXAS. Travis Co.: *Valdés-R. 1653*.

Dasyochloa pulchella (H.B.K.) Willd. *ex* Rydb.

MEXICO. COAHUILA: Saltillo, *Valdés-R. 1532*, *Hatch et al. 5055a*. SAN LUIS POTOSÍ: Guadalcazar, *Valdés-R. 1642*, 20 mi N of San Luis Potosí, *Valdés-R. 1702*. UNITED STATES. NEW MEXICO. Grant Co.: *Valdés-R. 1683*, Otero Co.: *Morden 672*. TEXAS. Presidio Co.: *Valdés-R. 1686*, *1691*.

Tateoka (1961), Sanchez (1979a), and Renvoize (1983). Each bundle sheath, with its associated radial chlorenchyma, constitutes a discrete structural unit separated from similar adjacent units by large, clear bulliform cells. The radial chlorenchyma cells form one layer and are long, narrow, radially arranged, and contain few chloroplasts. This anatomical structure indicates that these grasses belong to the "C_4 plants" or "Kranz PS" as described by Brown (1977). The leaf epidermis of these grasses corresponds to Renvoize's (1983) general description of the Eragrostideae. Complete description of each species is given in Valdés-Reyna (1985).

ERIONEURON NASH

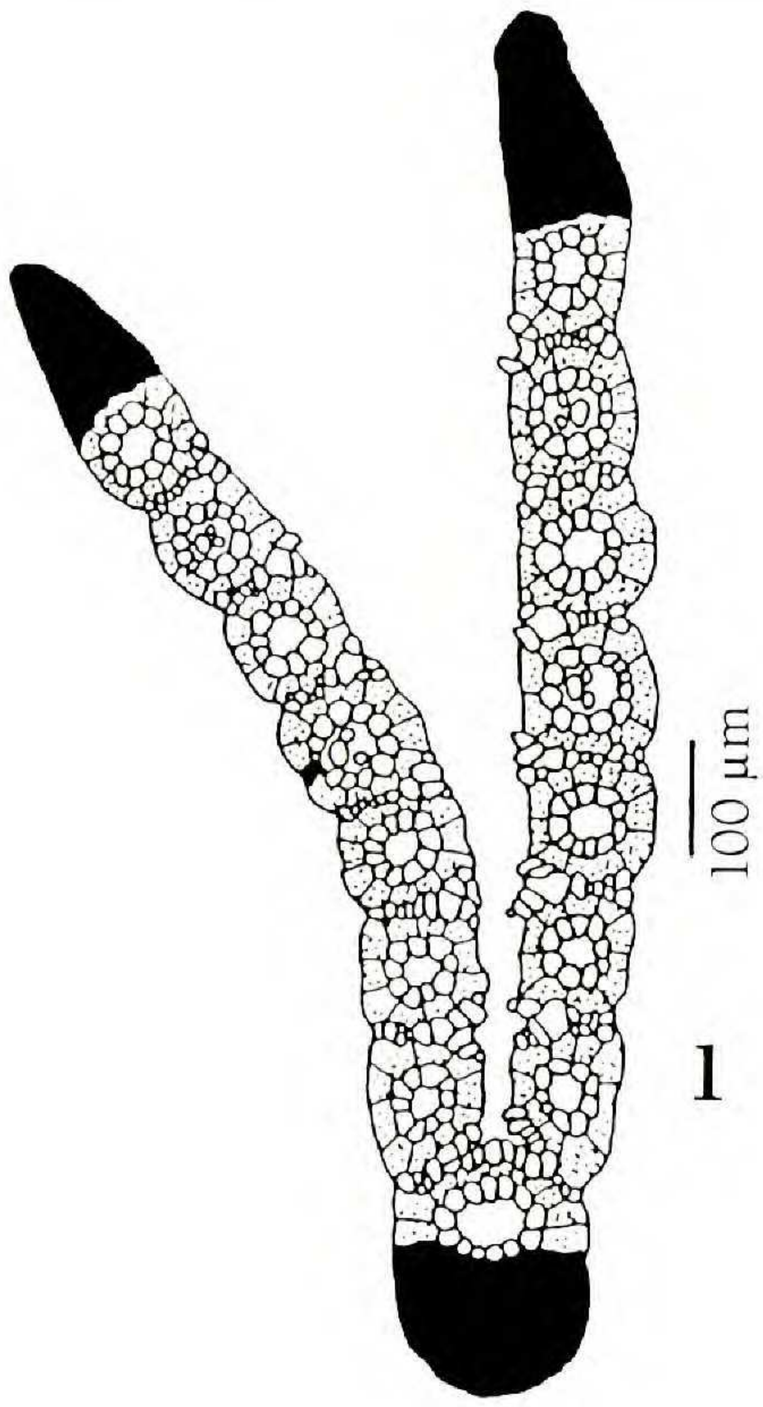
Laminas are V-shaped, i.e. conduplicate, narrow to standard, the adaxial side slightly sinuous with ribs and furrows present. The abaxial side of the lamina is sinuous with well-marked ribs and furrows present, containing a prominent central vein. Sclerenchyma are associated with the vascular bundles (VB's), and a small strand sometimes forms a girder between the bundle and the abaxial and adaxial epidermis. Bulliform cells are inflated and fan-shaped. The leaf epidermis contains intercostal long cells on both epidermes that are moderate to strongly sinuous. Stomata occur in 1–2 rows per intercostal zone with triangular subsidiary cells. Intercostal short cells occur as silico-suberose pairs between long cells. One papillae per cell occurs on the adaxial surface. Prickle hairs are distributed on intercostal and costal zones.

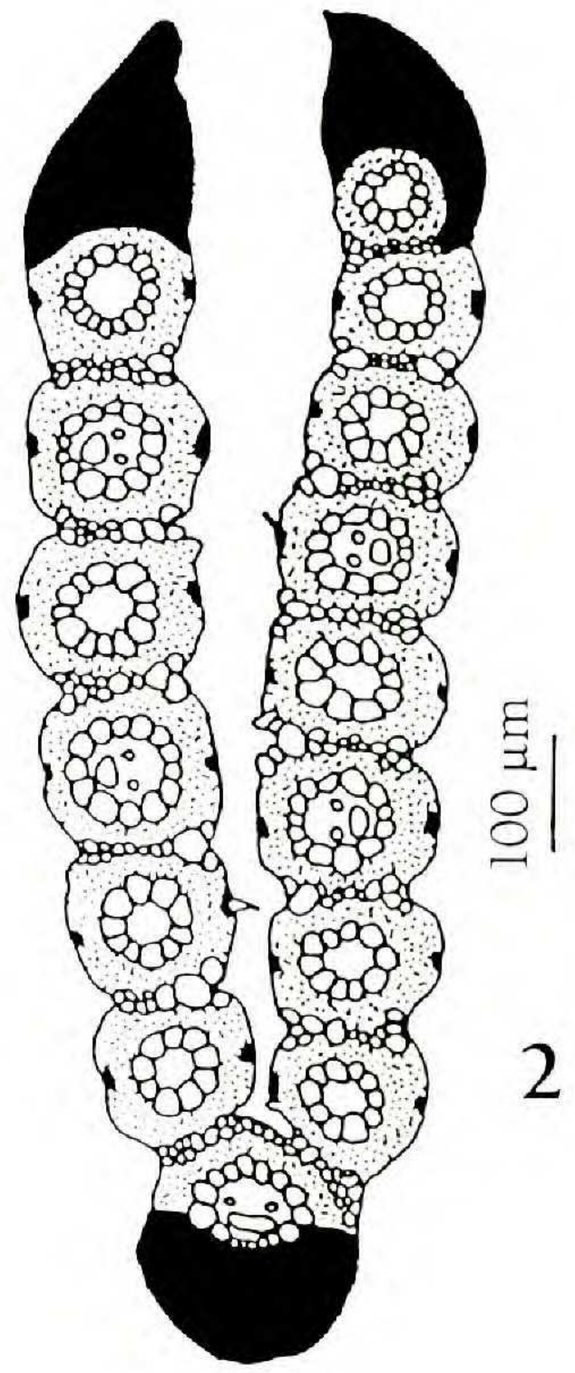
Microhairs have a spherical distal cell. The macrohairs are unicellular. The costal zone has a row of short cells, each alternating with silica cells. Silica cells are mostly dumbbell- to saddle-shaped.

Erioneuron pilosum (Buckl.) Nash

Transverse section (Figs. 1 & 5).—Lamina is V-shaped, with a narrow to standard angle, 2.4 mm wide, 0.12 mm thick, 13–15 vascular bundles wide. The adaxial side is slightly sinuous with furrows and the abaxial side with slight to shallow furrows, the ribs well-marked. The prominent midvein has a well-developed keel, and the colorless cells, bulliform cells, and sclerenchyma cells are associated with the median vein. The bulliform cells penetrate through the abaxial epidermis. Sclerenchyma are absent adaxially and very abundant abaxially. One primary VB comprises the keel. The position of the VB is at the same level for all bundles of different orders. These bundles are situated in between the center and the adaxial surface. Three primary, (including the midvein), two secondary, and 10 tertiary VB's are present, and round in outline. Mestome sheath cells are small, thick-walled, and surround the primary and secondary VB's, interrupting the tertiary VB's. Parenchyma sheath cells are large and thin-walled in the primary VB's and continuous or sometimes interrupted by sclerenchyma. The sclerenchyma that is associated with primary VB's forms a girder between the bundles and abaxial epidermis, and sometimes the adaxial epidermis. Secondary and tertiary VB's have adaxial sclerenchyma present as a minute strand consisting of a few subepidermal fibers. Sclerenchyma cell walls are very thick; with a well-developed sclerenchyma cap present on the margins of the leaf. This sclerenchyma cap is not in contact with the lateral bundle, and is wider than tertiary VB's. The chlorenchyma are radiate, one cell layer thick, in tabular arrangement, and interrupted by the sclerenchyma where associated with the bundle. The chlorenchyma of successive VB's are separated by bulliform cells and colorless cells. The colorless cells form a girder-like extension to the opposite epidermis and are associated with the bulliform cells. The colorless cells are smaller than bulliform cells, not inflated, and have one extension from each group. Across most of the blade, 3–6 bulliform cells occur in the furrows, and are extensive over midvein and in the adjacent furrow. The epidermal cell walls are thick and covered by a distinct cuticle that is continuous over the epidermal cells. Prickle hairs are present. Macrohairs are absent. Papillae are present on adaxial surface and restricted to the intercostal zone. There is one papilla per cell that is relatively broad, but not much more than half the width of the epidermal cells.

Abaxial epidermis (Fig. 9b).—The intercostal long cells have margins that are deeply undulating, strongly corrugated, 50–170 μm long, and about





FIGS. 1-4. Whole leaf blade transverse sections of *Erioneuron* and *Dasyochloa*. Blackened areas indicate sclerenchyma tissue. Fig. 1. *E. pilosum*, *Valdés 1502*. Fig. 2. *E. avenaceum*, *Valdés 1644*. Fig. 3. *E. nealleyi*, *Hatch and Valdés 5050*. Fig. 4. *D. pulchella*, *Valdés 1686*.

10 μm wide. Stomata are in 1–2 rows per intercostal zone with triangular subsidiary cells. Intercostal short cells are solitary or paired between long cells; when paired the cells are silico-suberose, with tall and narrow smooth outlines. Papillae are absent. Bicellular microhairs occur as a single row attached to short cells, 20–25 μm long. The proximal cell is about 10 μm long, and the inflated and rounded distal cell is about 15 μm long. Prickle hairs are absent. Macrohairs are present on the intercostal zone. Costal zones have a row of paired short cells that are silico-suberosed and separated by normal costal short cells. These short cells have sinuous walls. Silica bodies, 8–10 μm long, are mostly dumbbell-and saddle-shaped, and relatively short.

Adaxial epidermis (Fig. 9a).—Epidermis is similar to the abaxial surface except for the following: intercostal zone long cells are slightly to moderately undulating; dome-shaped, inflated papillae are present, one per cell, with unthickened walls. Prickle hairs are infrequent on the intercostal zone.

Erioneuron avenaceum (H.B.K.) Tateoka

Transverse section (Figs. 2 & 6).—Lamina is V-shaped with a narrow to standard angle, 2.2 mm wide, 0.14 mm thick, 12–16 VB's wide. The adaxial side has ribs with slight to medium furrows, less than a quarter of the leaf thickness. The abaxial ribs are the same size to taller than the adaxial, appearing moniliform. The prominent midvein has a keel with one VB comprising the keel. The colorless cells, bulliform cells, and sclerenchyma cells are associated with the midvein. The bulliform cells in the adaxial epidermis are located above the median bundle. Sclerenchyma are absent adaxially and abundant abaxially. The position of the VB's is the same for all bundles of different orders. All bundles are positioned midway between the adaxial and abaxial surface. Five primary bundles (including the midvein) and 10 secondary bundles are present. Tertiary VB's were absent. Primary bundles are circular to elliptical in outline and vertically elongated; while secondary bundles are circular in outline. Mestome sheaths are composed of 10–12 small, thick-walled cells surrounding the primary and secondary VB's. The parenchyma sheath, of large thin-walled cells, is continuous or sometimes sclerenchyma interrupts the primary VB. Sclerenchyma are associated with the VB's on both the abaxial and adaxial surface and the strands consist of a few subepidermal fibers, sometimes forming a girder-like structure between the bundle and abaxial epidermis. The sclerenchyma cell walls are thick, with a sclerenchyma cap on the leaf margins. The chlorenchyma are radiate, in tabular arrangement, and separated from successive VB's by the bulliform cells and colorless cells. Colorless cells form a girder-like extension to the opposite epidermis, and are associated with bulliform cells but smaller. These cells are not inflated, and form one extension from each group. The furrows have 2–4 bulliform cells and are

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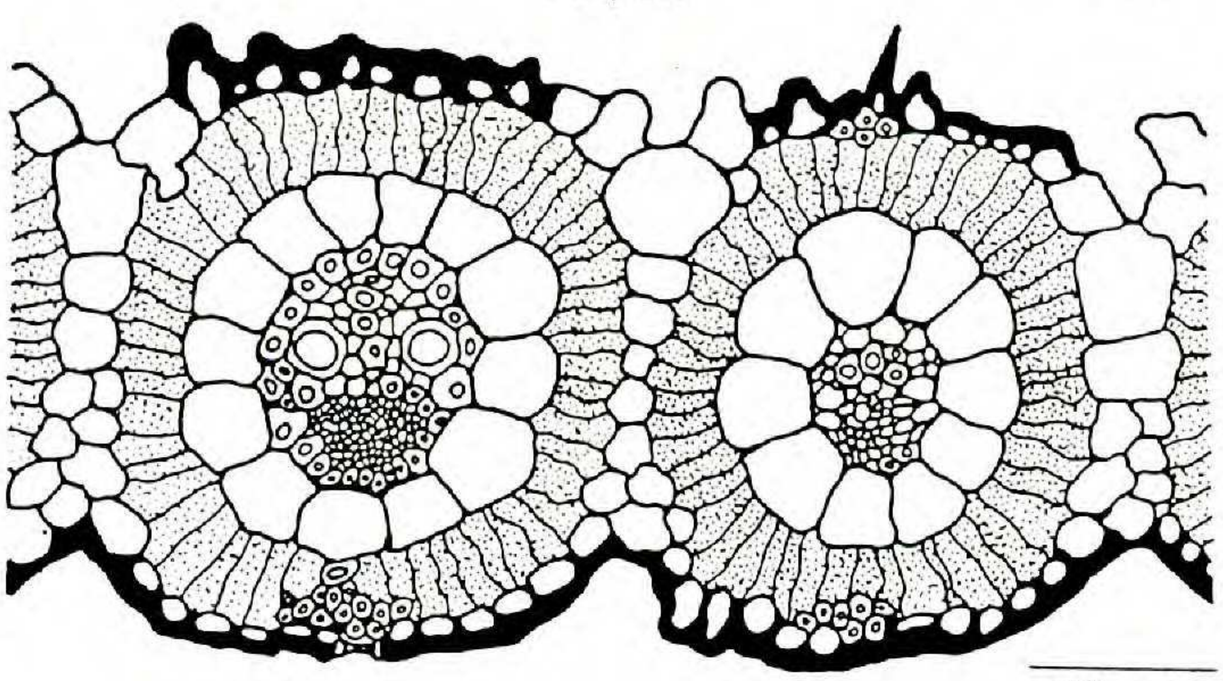

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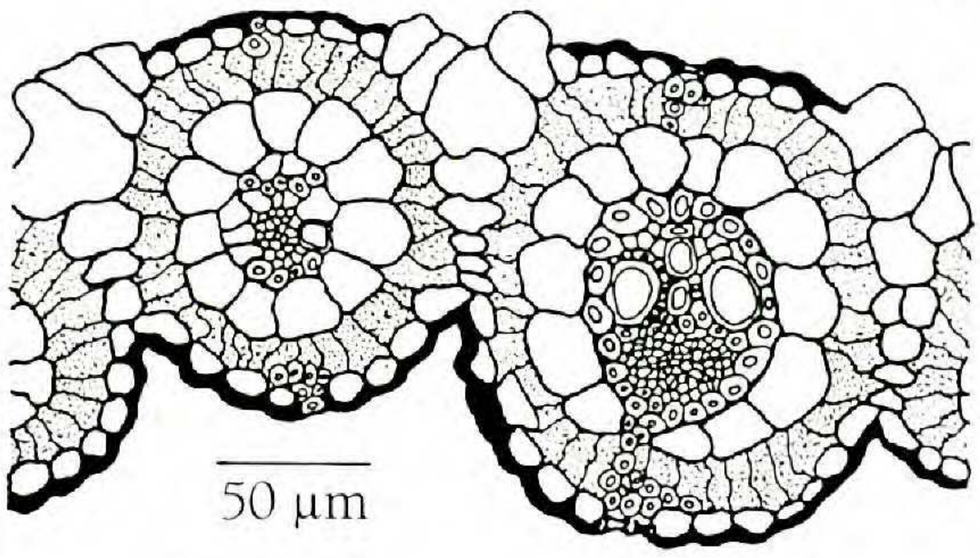

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FIGS. 5-8. Detail of primary and secondary vascular bundles of *Erioneuron* and *Dasyochloa*. Fig. 5. *E. pilosum*, *Valdés 1502*. Fig. 6. *E. avenaceum*, *Valdés 1644*. Fig. 7. *E. nealleyi Hatch and Valdés 5050*. Fig. 8. *D. pulchella*, *Valdés 1686*.

extensive over the midvein and in the adjacent furrows. The bulliform cells are inflated and fan-shaped. The cuticle is continuous over the epidermal cells. Prickle hairs are present on the adaxial surface. Macrohairs are absent. Papillae are present on the adaxial surface but restricted to the intercostal zone.

Abaxial and adaxial epidermis (Figs. 10a & 10b).—The anatomy of both surfaces is not different from that of *E. pilosum* epidermal surfaces; except that stomata, when seen, form one row per intercostal zone.

Erioneuron grandiflorum (Vasey) Tateoka

Significant differences were not observed between this species and *E. avenaceum*. Metcalfe (1960) reported the leaf anatomical features of *E. grandiflorum* [syn. *Tridens grandiflorus* (Vasey) Woot. & Standl.] and they correspond to our description of *E. avenaceum*.

Erioneuron nealleyi (Vasey) Tateoka

Transverse section (Figs. 3 & 7).—This species is similar to *E. avenaceum* and *E. pilosum* except that the lamina is 20–25 VB's wide. The adaxial surface is slightly sinuous, and the abaxial surface is moderately to shallowly ribbed and furrowed.

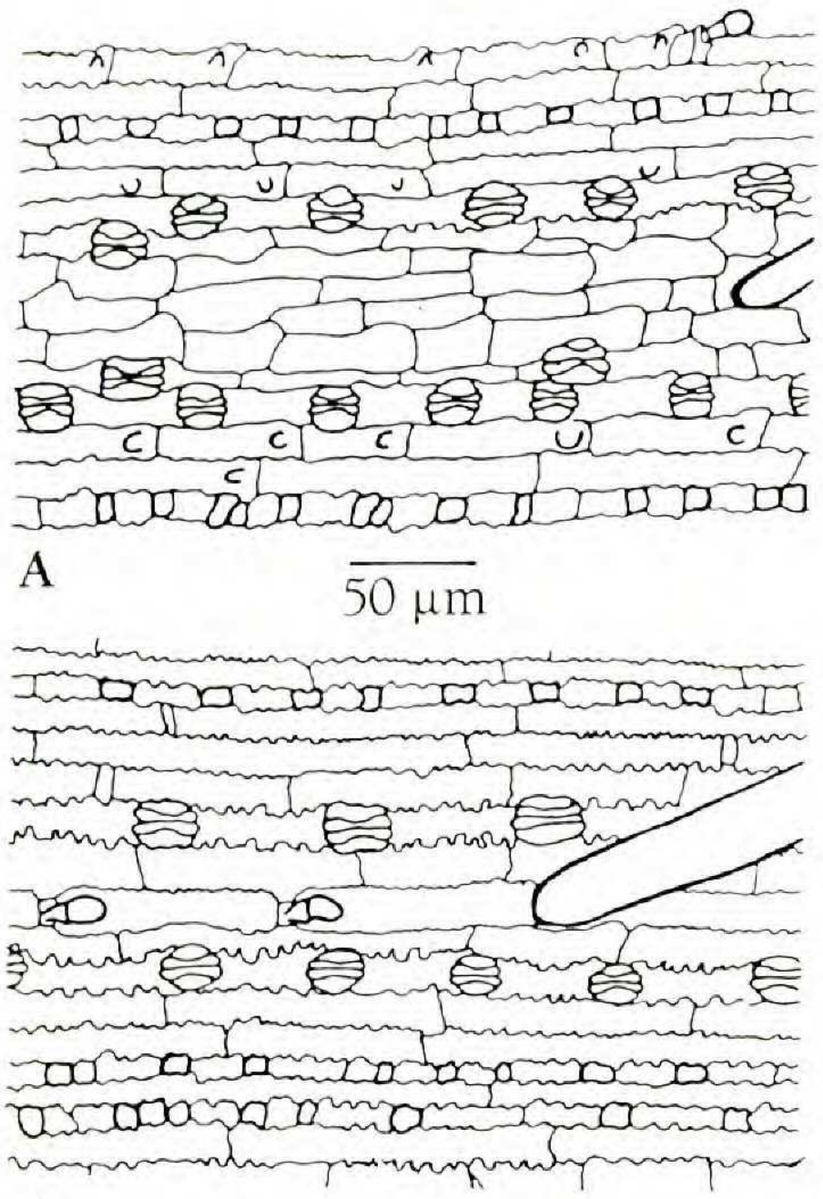
Abaxial epidermis (Fig. 11b).—Epidermis of *E. nealleyi* is similar to *E. avenaceum* and *E. pilosum* except that the intercostal long cell margins are moderately undulating.

Adaxial epidermis (Fig. 11a).—Similar to the species mentioned, except that the prickle hairs are more abundant.

DASYOCHLOA

Dasyochloa pulchella (H.B.K.) Willd. ex Rydb.

Transverse section (Figs. 4 & 8).—Lamina is U-shaped, without a definite angle formed with the midrib, 0.6–0.9 mm wide, 0.1 mm thick, 7 VB's wide. The abaxial and adaxial longitudinal ribs and furrows are moniliform. The bulliform cells are fan-shaped, the central one relatively small, and not much larger than bundle sheath parenchyma cells. Sclerenchyma are associated with the VB's on the adaxial epidermis with a well-developed strand that follows the shape of the adaxial rib. The well-developed sclerenchyma strand on the abaxial epidermis is wider than deep. The position of the VB's is at the same level for all orders. The three primary bundles and four secondary bundles are situated midway between the abaxial and adaxial surface. These types of bundles have a round outline. The thin-walled cells of the mestome sheath surround the VB's. The parenchyma sheath, of large thin-walled cells, is continuous or interrupted by scleren-



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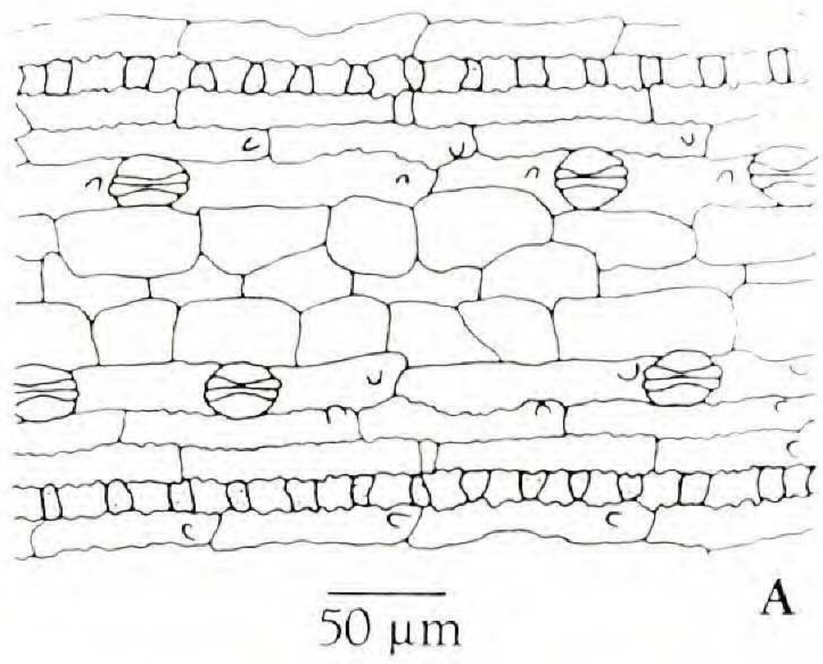

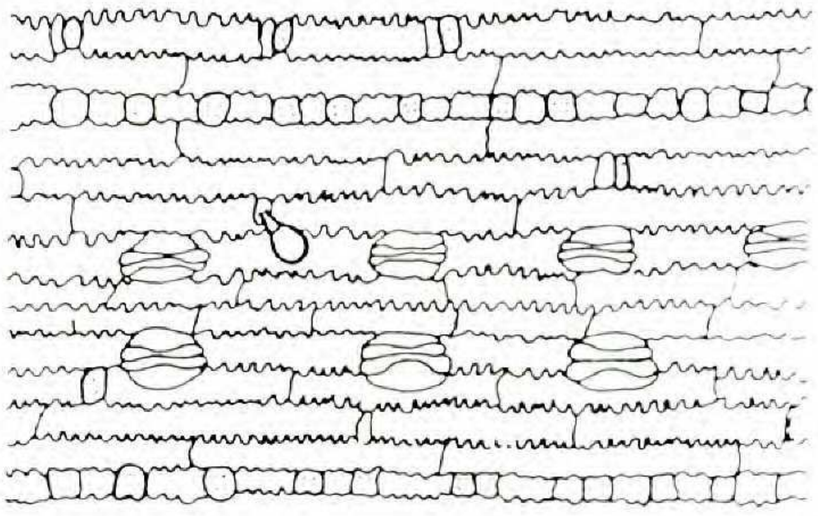

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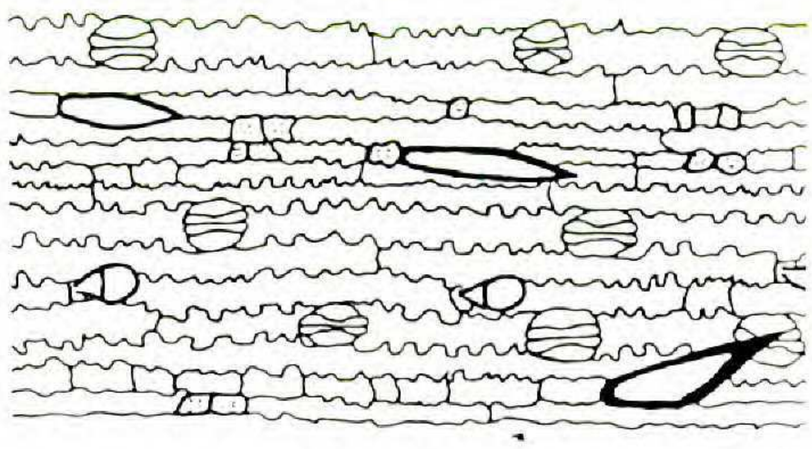

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FIGS. 9-12. Detail of adaxial and abaxial surface of leaf epidermis of *Erioneuron* and *Dasyochloa*. Fig. 9. *E. pilosum*, *Valdés 1653*. Fig. 10. *E. avenaceum*, *Valdés 1623*. Fig. 11. *E. nealleyi*, *Hatch and Valdés 5050*. Fig. 12. *D. pulchella*, *Valdés 1532*, *Morden 672*.

chyma on the primary VB's. The sclerenchyma are associated with the primary VB's forming a girder between the bundle and abaxial epidermis, and sometimes the adaxial epidermis. In the secondary VB's of the adaxial and abaxial epidermis the sclerenchyma are present as a minute strand consisting of few subepidermal fibers. The sclerenchyma cell walls are thick, and the lumen almost excluded. The well-developed sclerenchyma cap is present on the margin of the leaf, but not in contact with the lateral bundle. Chlorenchyma cells are radially arranged around the VB's in one cell layer, and interrupted by sclerenchyma when associated with the bundle. The chlorenchyma of successive VB's is separated by colorless cells and bulliform cells. Colorless cells form a girder-like extension to the opposite epidermis and are associated with and smaller than the bulliform cells. These cells are not inflated. Bulliform cells form a girder with associated colorless cells. The cuticle of epidermal cell walls is thickened and the associated cell wall occupies less than half of the depth of the cells. Prickle hairs present on both epidermes. Macrohairs are present. Papillae are absent on both epidermes.

Abaxial epidermis (Fig. 12b).—Intercostal long cells are 60–150 µm long, is about 10 µm wide, with deeply undulating margins. Stomata occur in 1 row per intercostal zone, and are dome-shaped, with rounded subsidiary cells. Intercostal short cells are solitary or paired and situated between long cells. Papillae are absent. Bicellular microhairs are 20–24 µm long and occur over intercostal long cells in 1 or 2 rows. The proximal cell is about 10 µm long, and the distal cell is about 12 µm long, and appears inflated and rounded. Prickle hairs, attached to short cells, are medium sized with the base as long as the stomata. They occur over the intercostal and costal zones. Macrohairs are present. Costal zones have a row of short cells with sinuous walls. Silica bodies are mostly dumbbell-shaped.

Adaxial epidermis (Fig. 12a).—This epidermis is similar to abaxial surface except for the following: The intercostal zone cells are slightly undulating; prickle and macrohairs are abundant.

The descriptions of *E. pilosum*, *E. avenaceum*, and *D. pulchella* correspond with the anatomical features presented by Sánchez (1979a, 1983) and Caceres (1950).

DISCUSSION

Transverse section.—In general *Erioneuron* is characterized by having a V-shaped lamina with ribs and furrows present. The abaxial ribs in *Erioneuron* are sometimes the same size or larger on the adaxial surface depicting a moniliform structure. However, *Dasyochloa pulchella* has U-shaped lamina with abaxial/adaxial ribs and furrows that form the moniliform structure.

The distribution of sclerenchyma in the leaf appears to be a reliable character relative to taxonomic relationships. The sclerenchyma associated with

the VB's sometimes forms a girder between the bundle and the abaxial and/or adaxial epidermis, but generally the girder is represented by small strands. *Dasyochloa pulchella* differs from *Erioneuron* by having well-developed sclerenchyma girders on the abaxial/adaxial epidermis. The sclerenchyma associated with the primary vascular bundle comprising the keel have been a key taxonomic character for the separation of *E. avenaceum* and *E. pilosum* (Sánchez 1979). *Erioneuron pilosum* has a prominent midvein with sclerenchyma occupying more than half of the keel, whereas *E. avenaceum* has one third or less sclerenchyma occupying the midvein.

The bulliform cells of *Erioneuron* species are fan-shaped as in *D. pulchella*, except the central one is smaller. Macrohairs are usually common on the adaxial epidermis of both genera. However, as mentioned by Sánchez (1983), *D. pulchella* macrohairs are more abundant on both epidermes.

Leaf surfaces.—Features of the abaxial and adaxial epidermis are similar in most characters between the two genera. In *Erioneuron*, papillae were present only on adaxial surface, whereas in *D. pulchella*, they were not observed.

Macrohairs are present in all species. However, they are more abundant in *E. nealleyi* on the adaxial surface, and in *D. pulchella* they occur on both surfaces.

A summary of the differences of the anatomical characters are presented in Table 2. The blades of *E. avenaceum* and *E. grandiflorum* had no differences in the anatomy. *Dasyochloa pulchella* has characteristics that differ from all *Erioneuron*. Therefore, these data support the recognition of *Dasyochloa* and *Erioneuron* as anatomically distinct genera.

TABLE 2. Diagnostic characters of the leaf anatomy in the genera *Erioneuron* and *Dasyochloa*. Species are referred to as: A = *D. pulchella*, B = *E. pilosum*, C = *E. avenaceum*, D = *E. grandiflorum*, and E = *E. nealleyi*.

CHARACTER	SPECIES				
	A	B	C	D	E
Transverse Section					
Lamina 1) V-shaped, 2) U-shaped	2	1	1	1	1
Adaxial and abaxial furrows 1) slight-to-deep, 2) moniliform	2	1	1	1	1
Sclerenchyma associated with VB 1) few fibers, 2) a strand, 3) a girder	3	1	2	2	2
Bulliform cells 1) fan-shaped, regular, 2) fan-shaped, irregular	2	1	1	1	1
Epidermis					
Adaxial epidermis with one papillae on long-cells 1) present, 2) absent	2	1	1	1	1
Prickle hairs on adaxial surface 1) absent, 2) present	1	2	2	2	1

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BOOK NOTICE

CONNOR, S. 1994. **New England Natives.** (ISBN 0-674-61350-3, hbk.). Harvard University Press, 79 Garden Street, Cambridge, MA 02138-9983. $39.95. 274 pp.

This book was written to reveal "the evolving interaction between the people and the plants of New England ... by describing the wide range of uses, during different eras, to which men and women have put the various species of trees and shrubs ... in this region and describing the qualities of these plants and noting their distributions ..." Chapter 1, "A place in the forest," is devoted largely to relationships between plants and Native Americans of yesteryear. Chapter 2, "This wooden world," focusses on European settlers. Chapter 3, "Trees in the Marketplace and in the Garden," considers uses and decorative value of trees. And chapter 4, "The New Yankee Forest," discusses ecology and more uses. A prominent member of the volume's *dramatis personae* is the Arnold Arboretum. The book is abundantly illustrated with 24 color plates of plants (mostly trees) and 194 black-and-white illustrations (mostly photographs but also reproductions of old illustrations related to trees and tree products). Well written, the book certainly shows well the "overwhelming significance of wood in the history of the Republic" and "the use of the forest as more than mere scenery." It would be a fine addition to the list of "suggested readings" for any general botany or biology course or course on economic botany. And it is good reading for just about anybody interested in plants and people.—*John W. Thieret.*